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DEVICE TEST AND EVALUATION MASTER PLAN FOR THE ELECTRONIC EQUIPMENT MAINTENANCE TRAINING SYSTEM (DEVICE 11B106)

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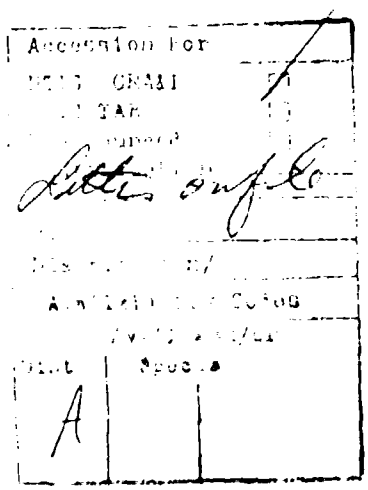

Released by
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FOREWORD

This research and development was conducted in support of Navy Decision Coordinating Paper Z0789-PN, Subproject .01 (Class "A" Electronic Equipment Maintenance Training (EEMT) System) and was sponsored by the Chief of Naval Operations (OP-115 and OP-987H) and the Chief of Naval Material (NMAT-08E1).

This report is the third in a series concerning the EEMT project, which has been divided into four phases: (1) concept formulation, (2) system definition, (3) prototype development, and (4) system test and evaluation (T&E). Previous reports have described Phases I and II (NPRDC TN 79-3 and NPRDC TR 81-11). This report forwards the EEMT Device Test and Evaluation Master Plan (DTEMP), which is a product of Phase II and was prepared under contract N00123-78-C-0925 to Honeywell Systems and Research Center. The DTEMP has been approved by CNO (OP-115) and will be implemented by the Training Analysis and Evaluation group (TAEG), Orlando, FL commencing in FY 1981. Subsequent reports to be published concerning Phase II will address EEMT life cycle costs and the T&E syllabus documents.

Two other reports have been published on a related research project. These reports described the field evaluation of and hardware/software development for the Generalized Maintenance Trainer Simulater (NPRDC TRs 80-30 and 81-9).

Appreciation is extended to Mr. Ted Pearson, Dr. Lyle MacKeraghan, and Mr. William Stubbs of TAEG, who provided their time and ta[illegible]ts during the review and final preparation phases.

The contracting officer's technical representative was Dr. James S. McMichael.

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INTRODUCTION

Problem

The use of operational equipment as a primary means for providing training and hands-on practice of electronics maintenance tasks in electronics-oriented class "A" schools can be costly, inefficient, dangerous, and inadequate. Therefore, the Navy has initiated an engineering development effort to develop, test, and evaluate a general-purpose electronic equipment maintenance training (EEMT) system that can significantly reduce reliance on operational equipment at the class "A" school level. Planning for system test and evaluation (T&E) is required in support of this effort.

Background

The EEMT project was initiated in response to Operational Requirement (OR) PN-50 of 26 July 1976 and is being conducted in support of Navy Decision Coordinating Paper (NDCP) Z0789-PN.01. The OR recognized the deficiencies associated with the use of operational prime equipment at the "A" school level and established performance goals and general criteria to be met by the training system. The EEMT project was divided into four phases: (1) concept formulation, (2) system definition, (3) prototype development, and (4) system test and evaluation (T&E).

In Phase I, which involved the completion of training pipeline and preliminary cost analyses, concept feasibility was affirmed and a basic system design concept was formulated (Wylie & Bailey, 1978). The Electronics Technician (ET) and Electronic Warfare Technician (EW) Class "A" schools were designated as the target users of the prototype EEMT.

In Phase II, it was demonstrated that a great deal of commonality exists in "A" school curriculum for the ET and EW ratings and that it was feasible to implement this curriculum using the EEMT (Pine, Koch, & Malec, 1981). The design for the prototype EEMT was selected and specifications were prepared for two-dimensional (2D) and three-dimensional (3D) subsystems. Also, input for the EEMT Device Test and Evaluation Master Plan (DTEMP), which will govern EEMT T&E during Phase III (system definition) and beyond, was developed.

Purpose

The purpose of the effort described herein was to develop the EEMT DTEMP. This plan will be used to (1) direct and control all T&E phases, and (2) identify contractor and government resources, long-range planning programming and budgeting required to support the T&E effort.

APPROACH

The preparation of the EEMT DTEMP was guided by OPNAV Instruction 3960.10 of 22 October 1975, which (1) establishes policy for test and evaluation (T&E) in Navy acquisition programs, (2) defines developing agency responsibilities for planning, conducting, and reporting T&E activities, and (3) provides the basic guidelines and format for preparing T&E plans. The EEMT DTEMP was tailored to apply to a training system and was designed to provide for two types of testing: (1) device test and evaluation (DT&E) and (2) training capabilities testing (TCT). Also, it was to provide for testing at the various systems acquisition stages.

DT&E is intended to focus on certain developmental issues involving the demonstration of 2D and 3D system design features and to provide for testing various training and component hardware/software performance capabilities. This will include measures of system reliability, maintainability, and supportability characteristics. Also, it is to provide for phased testing of 2D, 3D, and combined 2D/3D trainer capabilities as appropriate within the context of the hardware system design. These tests are to be conducted both in the contractor's facilities and in the class "A" school laboratory environment.

TCT involves the experimental evaluation of both EEMT performance and trainee achievement when the trainer is employed in the class "A" school. Trainee performance is to be assessed in accordance with the design goals and objectives specified for the entire EEMT (trainer, teachware, and supportive materials). The TCT is to be conducted in two phases at the ET "A" school, Service School Command, Great Lakes, IL and the Consolidated Naval Electronics Warfare School (CNEWS), Pensacola, FL. Each phase will employ identical measurement criteria and test procedures. However, they may differ, depending on the specific operational hardware characteristics included in the EEMT teachware and 3D component.

RESULTS

A DTEMP was prepared that is consistent with policies and procedures established in OPNAV Instruction 3960.10 and that addresses specific T&E issues outlined in OR PN-50 and NDCP Z-0789-PN. A copy of this plan is provided in the appendix.

The DTEMP incorporates measures of both hardware and training system performance. It has been reviewed and approved for implementation by the Chief of Naval Operations (OP-115). Implementation, commencing in FY 1981, will be directed by the Training Analysis and Evaluation Group (TAEG), Orlando, in accordance with details and schedules contained in the DTEMP.

CONCLUSION

The DTEMP provides for a comprehensive test of EEMT hardware and training system capabilities. Programmatic implementation should provide appropriate measures of system reliability, supportability, and suitability for service use.

FUTURE DIRECTION

Planning for T&E implementation is currently underway. The first two EEMT 2D units will be delivered to NAVPERSRANDCEN in June 1981 and will be used primarily for demonstration, lessonware/software review, and support of on-going research. Ten 2D units will be delivered to the ET "A" school, Great Lakes, in September 1981; and eight, to CNEWS Pensacola, in December 1981. 2D unit DT&E will commence following delivery and installation and will continue through the second quarter of 1983. One 3D unit will be delivered to each test site in April 1982 and will be integrated into the T&E program.

REFERENCES

Pine, S. M., Koch, C. G., & Malec, V. M. Electronic equipment maintenance training system: System definition (NPRDC Tech. Rep. 81-11). San Diego: Navy Personnel Research and Development Center, May 1981.

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APPENDIX A

DEVICE TEST AND EVALUATION MASTER PLAN FOR THE ELECTRONIC EQUIPMENT MAINTENANCE TRAINING SYSTEM (DEVICE 11B106)

DEVICE TEST AND EVALUATION MASTER PLAN
Electronic Equipment Maintenance Training System (Device 11B106)

Part I
Administrative Information

1. Full Program Title: Class "A" Electronic Equipment Maintenance Training System

2. Program Element No. 64703N Project No. Z0789-PN

   S&TO No. _____ OR No. OR-PN50

   DP No. DP-PN50

3. Acquisition Category: III DA: NAVPERSRANDCEN

4. Points of Contact:

TITLE	NAME	CODE	PHONE NO.
OPNAV Mission Sponsor	M. K. Malehorn	OP-102	AV: 224-5016 (202) 694-4898
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DA Test Director	V. M. Malec	NAVPERSRANDCEN	AV: 933-7122 (714) 225-7122
OT Director	C. Cordell	TAEG	AV: 791-4367 (305) 646-4367

5. Funding and Procurement:

	Fiscal Year ($ in millions)						
	79 & Prior	80	81	82	83	84	85
a. Funding							
RDT&E	1.660	1.061	.993	.757	.101		
Procurement							
b. Procurement Quantity							
Preproduction Prototype			20				
Production				TBD	TBD	TBD	

6. Delivery and Installation:

	Fiscal Year (No. of Units)					
	80	81	82	83	84	85
a. Delivery Schedule						
Preproduction Prototype		20[1]				
Production				TBD	TBD	TBD

b. Programmed Installation

FY 81/82: EW "A" School, NAVTECHTRACEN, Pensacola, FL, and ET "A" School, Great Lakes, IL FY 83, 84, 85: TBD.

7. Remarks: None.

[1]Student station--A student station consists of a 2D and 3D capability with peripherals. There will be 20 prototype 2D units and 2 prototype 3D units that interface with 2D units.

DEVICE TEST AND EVALUATION MASTER PLAN
Electronic Equipment Maintenance Training System (Device 11B106)

Part II
Description

1. System Description and Mission

a. Training System Description. The electronic equipment maintenance training (EEMT) system will be used to train "A" school level students to maintain those electronic equipments typically maintained by electronic technicians (ETs) and electronic warfare technicians (EWs) in the fleet. These equipments include: radar, communication, electronic countermeasure (ECM), and electronic support measure (ESM) equipments.

b. Functional (Training Mission) Description. An EEMT system is intended to be a generic system that will train more students more cost effectively and to greater proficiency in less time than current training processes.

The EEMT system is intended to provide Class "A" school electronics trainees with hands-on practice of generic preventive and corrective maintenance procedures. The system will provide self-paced instruction adaptable to the skills and needs of individual trainees. Immediate feedback will be provided on trainee performance. The system will also provide both computer-assisted and computer-managed instructions such that trainee performance skills can be tested. These features will also allow instructor-level personnel to schedule, monitor, and assess the training process and intervene when necessary.

Training tasks will be allocated between the two-dimensional (2D) and three-dimensional (3D) units of the system such that those tasks that can be trained sufficiently on the 2D unit are taught there. Only those tasks that require 3D cues and manipulation of switches and controls will be trained on the 3D unit. Accordingly, it is intended that training will be carried out predominantly in an interactive 2D format with the 3D unit used primarily for hands-on training.

c. Hardware Description. Each EEMT system trainer will consist of a 2D interactive display unit and a 3D simulated electronic equipment unit. The 2D and 3D units will be capable of a combined or attached configuration. The 2D unit will consist of a processor with support software, instructor terminal, graphic display device, adaptive display device, and user input device. The 3D unit will consist of a processor with support software, a support frame containing simulated generic electronic equipment modules, and simulated test equipment test modules, instructor terminal, user input device, and performance feedback devices. When in a combined configuration, a data transmission link (cable) will be used to attach one 2D unit to a single 3D unit.

2. Critical T&E Issues (from NDCP-Z0789-PN, 16 June 1978).

a. Issues to be tested during DT-III:

(1) Are various subunits of system functionally compatible when interfaced?

(2) What is the programming feasibility of effectively driving and integrating hardware and software?

(3) What is the adequacy of the developed data base and its application to effective teachware?

(4) Can the EEMT system be designed to safeguard against student misuse leading to injury of personnel and equipment?

b. Training Issues.

(1) Issue: Will EEMT system training improve the transition between the electronic fundamentals and equipment-specific segments of ET and EW electronics maintenance training?

Resolution: T&E will be used to assess the performance of "A" school graduates from the proposed training system with that of graduates from the existing curriculum.

(2) Issue: Can EEMT system training reduce the need for operational prime equipment in electronic equipment maintenance training?

Resolution: This issue will be addressed indirectly by estimating the number of prime equipments that would have been required to provide an equivalent amount of hands-on practice in the existing curriculum.

(3) Issue: Do the tasks, skills, and knowledges learned on the EEMT system generalize to the larger population of equipments maintained by ETs and EWs?

Resolution: Transfer of training can be assessed by observing how well students can perform the learned maintenance tasks on specific operational equipment.

(4) Issue: Will the EEMT system lead to a training improvement of, at least, 10 percent in terms of reduced training time, and increased levels of student proficiency with no increase in retraining time at "C" school?

Resolution: This issue can be verified with data from the pilot course, the end-of-course test, and the "C" school questionnaires.

(5) Issue: Will the EEMT system be self-sufficient so that it can be maintained and supported by school personnel?

Resolution: The ability of school personnel to support and maintain the EEMT system will be demonstrated during DT-III.

3. Objectives and Thresholds

a. Program Test Objectives. The T&E program will determine if the device can:

(1) Adapt to changing job demands.

(2) Accommodate slow, moderate, and fast learners.

(3) Maximize effectiveness of individual hands-on preventive maintenance training.

(4) Increase student/instructor ratio.

(5) Train to appropriate vacuum tube, solid state, and/or large-scale integration (LSI) technology.

b. Program Thresholds

(1) Cost. A long-range goal is to provide electronics training with the EEMT system at about half the cost needed to acquire, operate, and maintain conventional hardware to accomplish the equivalent electronics training. Specific recurring design-to-cost goal is $50,000 per student station (2D-3D unit combination).

(2) Performance. A training improvement of at least 10 percent shall be required to continue development. Improvement shall be expressed in reduced training time, reduced reliance on operational equipment, increased levels of student proficiency on related training system measures, and no increase in retraining time.

(3) Schedule. Delivery dates:

Item	Date
Serial numbers 1 and 2 of 2D EEMT (NAVPERSRANDCEN)	June 81
Serial numbers 3 thru 12 of 2D EEMT (ET "A" School, Great Lakes, IL).	August 81
Serial numbers 13 thru 20 of 2D EEMT (EW "A" School, Pensacola, FL).	December 81
Training Course (Maintenance of 2D, MIL-STD 1379 Training Course).	January 82
Serial numbers 1 and 2 of 3D EEMT (one each to the ET and EW schools listed above).	April 82

4. Required Technical Characteristics (from 2D EEMT and 3D EEMT Specs.)

Parameter	Milestone III Threshold	Post III Goal
2D Unit		
Computer system		
Language	Pascal	Ada
Processing capacity	Worst-case path ≤ 50% of total time for iteration or solution cycle	Same as Milestone III
RAM capacity	≤ 50% of main memory used for program and data storage	Same as Milestone III
Disk (mass storage) capacity	≤ 50% of total used for program and data storage	Same as Milestone III
	Storage capacity 3.5×10^6 bytes	Same as Milestone III

Parameter	Milestone III Threshold	Post III Goal
2D Unit (continued)		
Disk (mass storage) capacity (continued)	Access speed 200 ms/random access	Same as Milestone III
	Read error rate 1 in 10^9 bits	Same as Milestone III
Instructor terminal		
Data transmission speed	300 baud	Same as Milestone III
Soft vare		
Demonstration/ readiness	Exercise 100% of system's functional components	Same as Milestone III
Graphic (pictoral) display		
Resolution	TBD	
Capacity	$\leq$ 1,500 separate images total, or	Same as Milestone III
	$\leq$ 150 different background images	Same as Milestone III
Display image access time	5 seconds maximum	Same as Milestone III
	$\leq$ 50 images accessible in < 2 seconds	Same as Milestone III
Image distortion	1% of maximum image dimension minimum	Same as Milestone III
Adaptive display device	TBD	
User input device		
Precision	Within 1/8 inch maximum	Same as Milestone III
Response time	2 seconds maximum	Same as Milestone III
Mean time to repair (MTTR)	TBD	Same as Milestone III
Availability	90%	Same as Milestone III

Parameter	Milestone III Threshold	Post III Goal
3D Unit		
"Support" mainframe		
Capacity	Three plug-in equipment modules	Six plug-in equipment modules
Computer system		
RAM capacity	≤ 50% of total used for program and data storage	Same as Milestone III
Disk (mass storage) capacity		
Transfer rate	Entire operational program of data base loaded in 2 minutes or less	Same as Milestone III
Simulated generic equipment modules		
Expansion capability	100% minimum	None
Software		
Demonstration/ readiness exercise program	All functional components	Same as Milestone III
Mean time between failures (MTBF)	NA	500 hours
Service life	NA	60,000 hours
MTTR	NA	30 minutes
Availability	NA	$.9 \times \frac{MTBF}{MTBF} + MTTR$

5. Required Training Characteristics (from NDCP-Z0789-PN, 16 June 1978, 2D EEMT and 3D EEMT Specs.)

a. Overall Training Characteristics.

(1) Provide hands-on training of electronic maintenance tasks and principles.

(2) Provide generic systems training; that is, tasks and equipments trained common to population of tasks and equipments used by ETs and EWs.

(3) Provide individualized, adaptive training; that is, provide immediate performance feedback and accommodate slow, medium, and fast learners.

b. Training Effectiveness.

(1) A 50 percent reduced reliance on operational prime equipment at Milestone III.

(2) A 10 percent performance improvement at Milestone III.

Milestone III Threshold: 10 percent
Post-Milestone III Goal: TDB

(3) 100 percent of training objectives for 2D at Milestone III met, and 100 percent of training objectives for 3D met at post-Milestone III.

c. Hardware Suitability.

(1) Reliability. Design reliabilities for the 2D and 3D units are given in Required Technical Characteristics (Part II, No. 4).

(2) Maintainability. The EEMT system will be maintained by Navy personnel.

(3) Availability. The trainer will be designed to be available for scheduled operation in the training environment a minimum of nine-tenths (0.9) of the time.

Availabilities are given in the Required Technical Characteristics (Part II, No. 4).

(4) Logistics supportability. The EEMT system will be logistically supportable at the schools where the systems are deployed. Spares will be sufficient to repair all critical/major failures during a (TBD) month period.

(5) Compatibility. The EEMT system will be physically, functionally, and electrically compatible with the school laboratory environments in which they are deployed.

(6) Interoperability. Performance data from the EEMT system will be interoperable with Navy CMI systems.

(7) Training. Operation of the EEMT system will require no more than 2 weeks of formal training supplemented by on-the-job training. Maintenance of the system will require no more than 4 weeks of formal training supplemented by on-the-job training.

(8) Transportability. Trainer design will stress ease of transportation and simplicity of assembly and disassembly.

(9) Safety. The simulator will incorporate basic system safety principles. Safety devices, provisions, or procedures will be provided as necessary to ensure maximum safety during operation and maintenance of the trainer. The provisions of Requirement 1 of MIL-STD 454 shall be used as a design code.

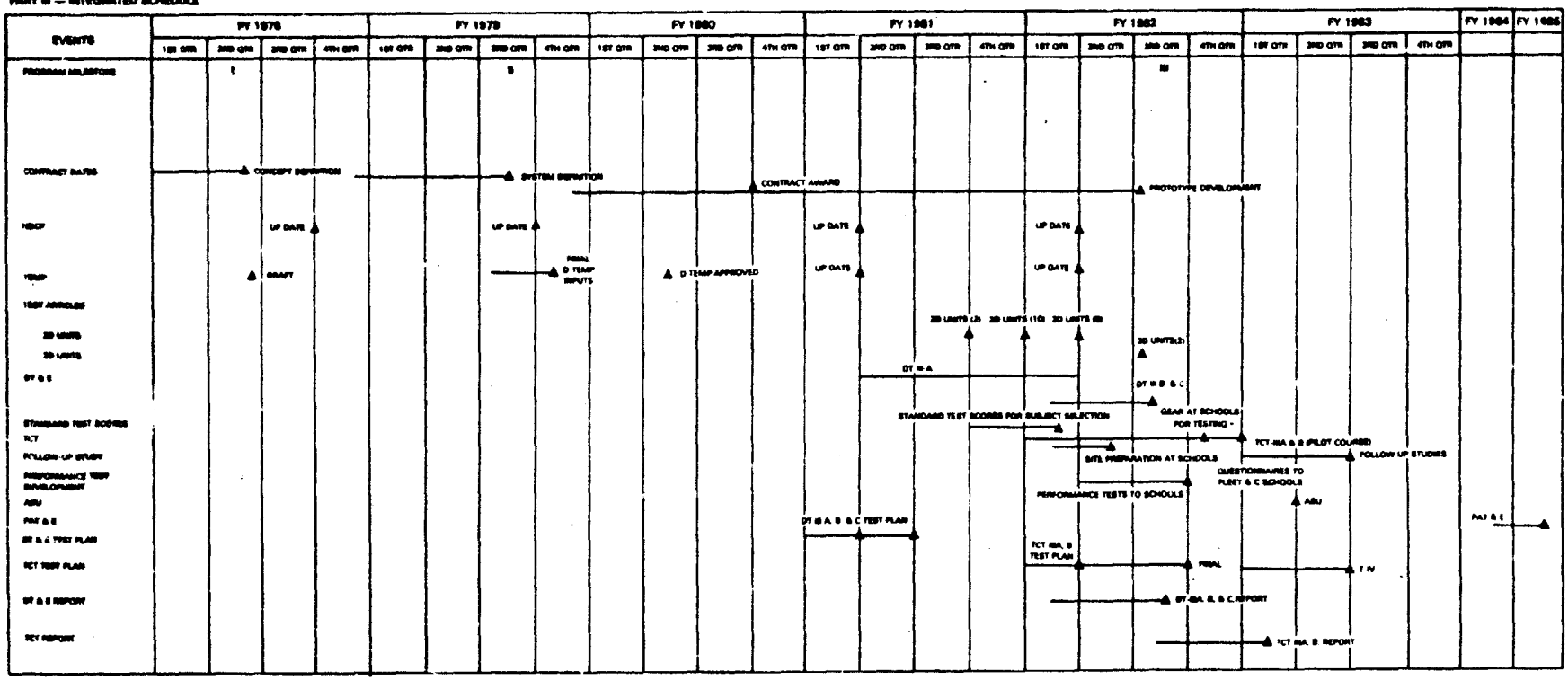
(10) Human factors. The trainer will incorporate man/equipment interface features that maximize efficient and safe operation. The provisions of MIL-STD 1472 will be used as a design guide.

6. Environmental Impact of T&E

None.

DEVICE TEST AND EVALUATION MASTER PLAN
ELECTRONIC EQUIPMENT MAINTENANCE TRAINING SYSTEM

PART III — INTEGRATED SCHEDULE



*ABSENCE PERFORMANCE TEST FOR TCT III IS AT END OF COURSE, AND CONTROL AND EXPERIMENTAL GROUPS ARE RUN DURING SAME PERIOD

DEVICE TEST AND EVALUATION MASTER PLAN
Electronic Equipment Maintenance Training System (Device 11B106)

Part IV
Device Test and Evaluation (DT&E) Outline

1. DT&E to Date.

The range of training objectives required for the device has been identified. The fidelity requirements have been resolved. Alternative conceptual designs have been developed for the EEMT system. One alternative has been selected for prototype development.

2. Future DT&E.

a. DT-III for the prototype development will be carried out in three separate phases during FY81 and FY82. The 2D and 3D units will be tested separately during Phases A and B respectively. The integrated system will be tested during Phase C.

b. DT-III A (FY82).

(1) Equipment description. Prototype EEMT system trainer 2D unit hardware, software, teachware, and documentation will be required. The 2D unit will be a "brassboard" prototype.

(2) DT&E objectives. Testing will be designed to exercise the features listed in Table A-1 and will emphasize teachware-trainee-display interactive features, search time, and accuracy of displayed graphics.

(3) DT&E events/scope of testing/basic scenarios. Appropriate testing for the 2D stand-alone unit using programmed teachware modules will be conducted during DT-III A at the contractor's facility. Testing will include reliability, maintainability, and supportability during functional use over a 3-month period.

The teachware features will be tested by generating and verifying a brief teachware module from a prepared script. The instructional and evaluation feaures will be tested by running through teachware modules specifically prepared to exercise these features and by comparing the system responses and hardcopy output to the expected results. The remaining features will be tested by inspection and demonstration.

(4) Quantifiable scope of effort. Testing will require 90 days of effort and at least two teachware modules and accompanying scripts. The module used to verify the teachware system will be entered into the computer at the time of testing from a prepared script. The remaining teachware module(s) will be disk-resident and designed to exercise the remaining instructional and evaluation features. These same modules will be used again and run repeatedly for at least (TBD) hours a day for (TBD) consecutive days to evaluate reliability, maintainability, and supportability.

c. DT-III B (FY82).

(1) Equipment description. Prototype EEMT system trainer 3D unit hardware, software, teachware, and documentation will be required. The 3D unit will be a "breadboard" prototype.

Table A-1

2D Unit Features to be Exercised During DT-III

Unit	Feature
Computer Hardware/Software	Language--Pascal or Ada CPU processing time Size of RAM of mass storage
Instructor Terminal	Interfaces with any 2D unit Initiates operating modes Generates and modifies teachware Runs all programs Medium to low speed
Interface	Passes ASCII characters
Support Software	Computer maintenance and utility programs Demonstration/readiness program System diagnostic software
Graphic Display Device	Displays computer-selected static images High resolution 5 seconds maximum access time At least 50 images accessible within 2 seconds Display accuracy at least 1% of maximum image dimension Interactive $\geq$ 1500 images
Adaptive Display Device	Capable of computer generated guidance Interactive Provides feedback and diagnostics
User Input Devices	Selectivity precision--1/8 inch Audio indication of entry Displays selection within 2 seconds
System	Portable Clearly marked test points Interchangeable and standard equipment and parts Keeps student records Administers performance tests

(2) DT&E objectives. DT-III B will consist of analysis and functional demonstrations to verify design and performance characteristics of the 3D unit. The primary objective of DT-III B is to test the feasibility of the design and to demonstrate the implementation concept for the 3D unit.

(3) DT&E events/scope of testing/basic scenarios. Only testing and evaluation appropriate for the 3D unit operating in a stand-alone (not connected to the 2D unit) configuration will be conducted during DT-III B. Testing will be conducted using teachware and documentation prepared specifically for that purpose. Because of the breadboard nature of the 3D unit, it will not be necessary to conduct extensive tests of reliability, maintainability, and supportability, etc. Therefore, it will be possible to conduct all testing at the contractor's facility parallel with or immediately following acceptance testing.

The basic scenario for testing will be the same as in DT-III A but will exercise the features listed in Table A-2. It will emphasize trainee/simulated hardware/simulated test equipment timing relationships, and visual/functional fidelity features.

(4) Quantifiable scope of effort. DT-III B will require (TBD) days of testing and evaluation. At least two teachware modules and accompanying scripts will be needed. These will be similar to and serve the same purpose as those to be used in DT-III A but will be designed to exercise the features given in Table A-2.

d. DT-III C (FY82).

(1) Equipment description. Prototype EEMT system trainer 2D and 3D unit hardware, software, teachware, and documentation will be required. This is the same equipment used for DT-III A and B.

(2) DT&E objectives. DT-III C will consist of analyses and functional demonstrations to verify and demonstrate the interactive features of the 2D and 3D unit hardware, software, and teachware.

(3) DT&E events/scope of testing/basic scenarios. Only testing and evaluation appropriate for the EEMT system trainer 2D and 3D units operating in a connected configuration will be conducted during DT-III C testing. Testing will be conducted using teachware developed specifically to exercise the interactive features of a combined 2D/3D system. Testing will focus on 2D/3D processor communication, 2D/3D data transmission, and integration of problem exercises requiring alternate use of the 2D and 3D units.

(4) Quantifiable scope of effort. DT-III C testing will occur (TBD) following installation of the 2D and 3D units at the ET "A" School, Great Lakes, IL, and immediately preceding commencement of DT-III A. It will require (TBD) days of effort and at least two teachware modules to exercise the system's interactive features.

Table A-2

3D Unit Features to be Exercised During DT-III

Unit	Feature
Teachware	Interactive authoring language Conversational Menu of editing functions Query and student assistance capability Can generate and modify: • Training sequence • Maintenance procedures • Simulated readouts and waveforms • Faults • Performance criteria • Content and placement of cueing and feedback messages Accommodates slow, medium, and fast learners
Performance Evaluation	Extrinsic feedback Hardcopy performance summary
Generic Simulated Equipment Modules	Specified fidelity Functionally realistic Can be configured into equipments Malfunction insertion
Instructor Interface	Connects to Support Module Teachware generation and modification Hardcopy output
Student Input Device	Call for help Sign on Select and load exercises Identify malfunctions Troubleshoot and isolate faults Identify faulted unit(s) Indicate repair actions
System	System readiness checks Safeguards against trainee error and misuse

DEVICE TEST AND EVALUATION MASTER PLAN
Electronic Equipment Maintenance Training System (Device 11B106)

Part V
Training Capabilities Test (TCT) Outline

1. TCT to Date

None.

2. Future TCT

a. TCT-III A (FY81-82).

(1) Equipment description. Prototype and EEMT system trainer 2D and 3D unit hardware, software, teachware, and maintenance and operations documentation will be required. Other supportive media and materials necessary for the EEMT system trainer will also be required. This is the identical equipment used for DT-III.

(2) TCT objectives. The objective of TCT-III A is to experimentally evaluate both EEMT system performance and trainee achievement when the entire EEMT system (trainer, teachware, and supportive materials) is used in the ET "A" school environment. Using the requirements of Part II, section 3A.(1) (NDCP-Z0789-PN, 16 June 1978) as the basis, trainee performance will be assessed to determine EEMT effectiveness as outlined in Table A-3, which displays the major EEMT subsystem components to be integrated during the TCT phase of the program.

(3) TCT events/scope of testing basic scenario. For TCT-III A, the EEMT system will be used in the ET "A" school, Great Lakes and the EW "A" school, Pensacola. Following installation and checkout of the EEMT system trainer at the two designated schools during DT-III C, instructors and staff who will use the EEMT system during TCT-III A will be trained. Additionally, a site for the equipment to be used and performance test items and standards for the end-of-course performance test will be prepared and finalized.

A split, matched group design will be used for TCT-III. Two groups of subjects (trainees) of at least 50 subjects per group will be selected from each of two "A" school pipelines during the second quarter of FY82 and matched on existing standard test scores. At each of the two schools, one group (control) will be given the standard "A" school course followed by the end-of-course performance test. The two experimental groups will take the same curriculum as their comparable control groups but with the EEMT system. Identical final performance tests will be given to both control and experimental groups. An analysis of these data will provide an estimated index of both training and cost effectiveness of the EEMT system.

(4) Quantifiable scope of effort. TCT-III A will require 50 ET "A" school students in each of two groups at the ET class "A" schools (total 100). No less than 30 members of each group must complete the planned training and testing sequence. A test-bed for the performance test must be selected and secured. The end-of-course performance test and an alternative form of this test will be needed and should require no more than 60 minutes per trainee to complete. EEMT system teachware modules and related curriculum materials will also be required. The EEMT system teachware modules should have the same content and be of at least equal quality to the existing curriculum.

Table A-3

Major EEMT System Test and Evaluation Program Phases and Integration Components

	Phases	2D EEMT Subsystem	3D EEMT Subsystem	EEMT System
1.	Equipment Demonstration	Hardware	Hardware	Hardware
		Software	Software	Software
2.	Equipment and Representative Teachware Demonstration	Hardware	Hardware	Hardware
		Software	Software	Software
		Representative Teachware	Representative Teachware	Representative Teachware
3.	Equipment, Teachware Curriculum, and Training Utilization/Effectiveness Demonstration	Hardware	Hardware	Hardware
		Software	Software	Software
		Teachware Curriculum	Teachware Curriculum	Teachware Curriculum
		Representative trainee population (varying ability levels)	Representative trainee population (varying ability levels)	Representative trainee population (varying ability (levels)
		Times to reach criterion performance	Times to reach criterion performance	Times to reach criterion performance
		Degree of transfer of training task to specific equipment training/job task	Degree of transfer of training task to specific equipment training/job task	Degree of transfer of training task to specific equipment training/job task

b. TCT-III B (FY82).

(1) Equipment description. Same as TCT-III A except substitute EW "A" school, Pensacola, FL.

(2) TCT objectives. Same as TCT-III A except substitute EW "A" school, Pensacola, FL.

(3) TCT events/scope of testing/basic scenarios. Same as TCT-III A except substitute EW "A" school, Pensacola, FL.

(4) Quantifiable scope of effort. Same as TCT-III A except substitute EW "A" school, Pensacola, FL

c. Follow-up Study (FY82).

(1) Equipment description. No equipment is required.

(2) TCT objectives. The objectives of the follow-up study are to assess the performance of the experimental and control groups (TCT-III A and TCT-III B) during subsequent "C" school and fleet activity.

(3) TCT events/scope of testing/basic scenarios. The follow-up investigation will involve conducting surveys at the "C" schools and fleet assignments to determine the comparative performance of subjects in the control and experimental groups. Questions will be developed during the third quarter of FY82 and sent to supervisory personnel at the "C" schools and fleet billets to which subjects are assigned after completing "A" school.

d. TCT-IV (FY82).

Modification and/or corrections will be made as required to meet objectives of TCT-III A and B (OPNAVINST 3960.10, page 6, para D (d)).

3. Critical T&E Items

a. TCT-III A and B.

(1) EEMT system teachware modules and documentation available should be the same content and of at least equal availability to existing curriculums.

(2) Instructors, test personnel, and analysis and simulation support people trained at ET and EW "A" schools.

(3) Standard test scores obtained and control and experimental groups selected.

(4) Performance tests developed and documented.

(5) Operational equipments for testing selected and available.

b. Follow-up Study.

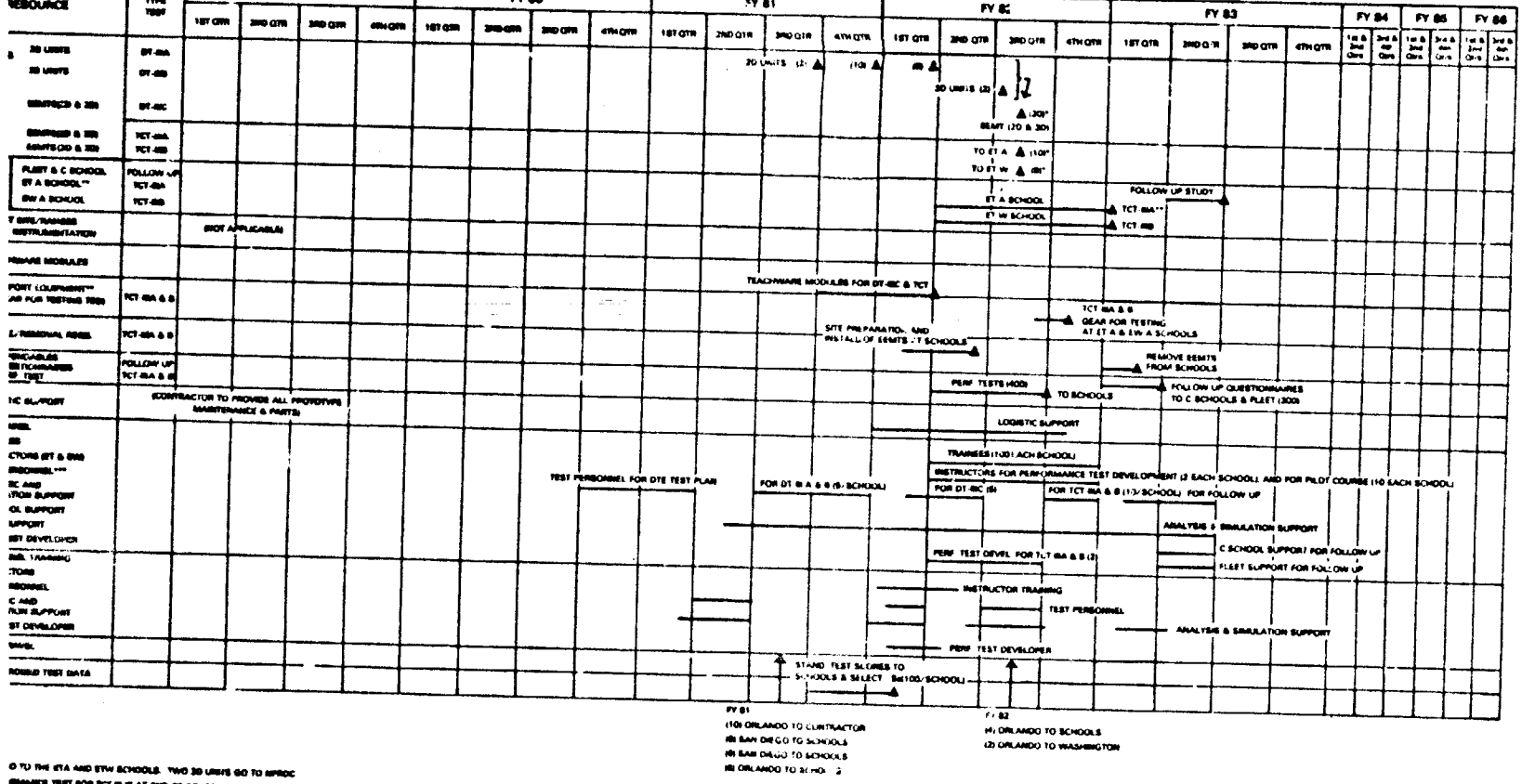
(1) Survey forms developed.

(2) Analysis support people trained.

(3) "C" school and fleet support arranged.

I — RESOURCE SUMMARY

DEVICE TEST AND EVALUATION MASTER PLAN
ELECTRONIC EQUIPMENT MAINTENANCE TRAINING SYSTEM



61-H

(1) TO THE ET A AND ET W SCHOOLS. TWO 30 UNITS GO TO NPROC
(2) ANALYSIS TEST FOR TCT III IS AT END OF COURSE, AND CONTROL EXPERIMENTAL GROUPS ARE RUN DURING SAME TIME PERIOD
*PERSONNEL, INSTRUCTORS AND ANALYSIS/ SIMULATION SUPPORT ARE DIFFERENT PEOPLE

DEVICE TEST AND EVALUATION MASTER PLAN
Electronics Equipment Maintenance Training System (Device 11B106)

Part VII
References

Navy Decision Coordinating Paper, Class "A" Electronic Equipment Maintenance Training System, NDCP-Z0789-PN, Department of the Navy, Washington, DC, 16 June 1978.

OPNAVINST 3960.10, Department of the Navy, Washington, DC, 22 October 1975.

Specification for the Electronic Equipment Maintenance Training System, Two-Dimensional System (EEMT-2D), (Appendix B to Pine, S. M., Koch, C. G., and Malec, V. M. Electronic Equipment Maintenance Training (EEMT) System: System Definition Phase (NPRDC Tech. Rep. 81-11). San Diego: Navy Personnel Research and Development Center, May 1981).

System Specification for the Electronic Equipment Maintenance Training System, Three-Dimensional System (EEMT-3-D) (Appendix B to Pine, S. M., Koch, C. G., and Malec, V. M. Electronic Equipment Maintenance Training (EEMT) System: System Definition Phase (NPRDC Tech. Rep. 81-11). San Diego: Navy Personnel Research and Development Center, May 1981).

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